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SUBJECT: Forwards response to questions in ref 950711 ltr re methodology for determining LTOP sys setpoints.

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July 17, 1995

U.S. Nuclear Regulatory Commission
Document Control Desk
Attention: Mr. Chris I. Grimes
Chief, Office of Technical Specifications Branch
Mail Stop 011E22
Washington, D.C. 20555

Subject: Technical Specification Improvement Program, Reactor Coolant System (RCS) Pressure and Temperature Limits Report (PTLR)
Rochester Gas & Electric Corporation
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

References: (a) Letter from R.C. Mecredy, RG&E, to A.R. Johnson, NRC, Subject: *Technical Specification Improvement Program*, dated May 5, 1995.

(b) Letter from C.I. Grimes, NRC, to R.A. Newton, Westinghouse Owners Group, Subject: *Request for Additional Information (RAI) Regarding WCAP-14040, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves,"* dated July 11, 1995.

Dear Mr. Grimes,

By Reference (a), RG&E submitted WCAP-14040 and a plant-specific methodology for determining Low Temperature Overpressure Protection (LTOP) system setpoints. These items were proposed to be used as the basis for the PTLR which would be implemented as part of the conversion to improved standard technical specifications for Ginna Station. By Reference (b), the NRC submitted questions with respect to both WCAP-14040 (Enclosure 1 to subject letter) and the RG&E methodology for determining LTOP system setpoints (Enclosure 2). The purpose of this letter is to respond to those questions provided in Enclosure 2. Responses to the questions provided in Enclosure 1, and to those questions in Enclosure 2 which are generic (i.e., questions in Enclosure 2 which are identical to those in Enclosure 1), are to be provided under separate cover by the Westinghouse Owners Group.

1. *Section 3.1 should be modified to clearly state that the most limiting mass addition transient should be considered for design of COMS. An inadvertent actuation of safety injection should be considered (assume all operable SI pumps deliver water into RCS) if it is more limiting than the case of a failure of the normal charging flow controls with letdown isolated.*

RG&E agrees that an inadvertent safety injection should be considered in the design of LTOP if it is a more limiting mass addition transient. However, the Ginna Station technical specifications require all three safety injection pumps to be inoperable when the PORVs provide for RCS relief capability and at least two safety injection pumps be inoperable when a 1.1 square inch relief path provides the RCS relief capability. These technical specification limits are in place since the installed LTOP system cannot otherwise mitigate an inadvertent actuation of safety injection. This approach has been previously reviewed and found acceptable by the NRC. Therefore, RG&E proposes to revise the last paragraph of Section 3.1 to read as follows:

> Two specific transients have been defined, with the RCS in a water-solid condition, as the design basis for LTOPS. Each of these scenarios assumes no RHR System heat removal capability. The RHR System relief valve (203) does not actuate during the transients. The first transient consists of a heat injection scenario in which a reactor coolant pump in a single loop is started with the RCS temperature as much as 50°F lower than the steam generator secondary side temperature. This results in a sudden heat input to a water-solid RCS from the steam generators, creating an increasing pressure transient. The second transient has been defined as a mass injection scenario into a water-solid RCS as caused by one of two possible scenarios. The first scenario is an inadvertent actuation of the safety injection pumps into the RCS. The second scenario is ~~caused by~~ the simultaneous isolation of the RHR System, isolation of letdown, and failure of the normal charging flow controls to the full flow condition. Either scenario may be eliminated from consideration depending on the plant configurations which are restricted by technical specifications. Also, v~~V~~arious combinations of charging and safety injection flows may also be evaluated on a plant-specific basis. The resulting mass injection~~/letdown mismatch~~ causes an increasing pressure transient.

2. *Provide basis of assuming 800 psia as the PORV piping limit in the COMS design.*

This question is the same as Enclosure 1, question 4 (i.e., this is a generic question which applies to both WCAP-14040 and the RG&E LTOP methodology). As such, the Westinghouse Owners Group will respond to this question.

3. *Section 3.2.5 indicates that in the selection of the PORV setpoints, the upper limits are specified by the minimum of the steady-state cooldown curve. Please discuss why the heatup curve is not considered in this process.*

   This question is the same as Enclosure 1, question 8 (i.e., this is a generic question which applies to both WCAP-14040 and the RG&E LTOP methodology). As such, the Westinghouse Owners Group will respond to this question.

4. *Section 3.2.5 indicates that the uncertainties in the pressure and temperature instrumentation utilized by the COMS are not accounted for in the selection of the COMS PORV setpoints. This is not acceptable to the staff. Please modify the methodology to consider the potential uncertainties in the instrumentation utilized by the COMS.*

   For determining a LTOP setpoint which is intended to protect only the 10 CFR 50, Appendix G limits, instrument uncertainty is not required due to the conservatism which is employed in the analysis. However, the LTOP setpoint at Ginna Station must also protect against RHR overpressurization. As such, instrument uncertainty does apply in the determination of the LTOP setpoint when using the RG&E methodology. Temperature uncertainty is accounted for in the selection of the initial conditions for the transients while pressure instrument uncertainty is accounted for in the actuation setpoint selection. Therefore, RG&E proposes to delete the fourth sentence of the second paragraph of Section 3.2.5 which states that instrument uncertainty is not included in the analysis. In addition, we propose to replace item q of Section 3.2.1 with "Instrument uncertainty for temperature (conditions under which the LTOP System is placed into service) and pressure uncertainty (actuation setpoint)" to clarify this position.

5. *In Section 3.2.1, items n and q describe the same parameter. Please correct this error.*

   As discussed in the response to question 4 above, item q is being replaced with "Instrument uncertainty for temperature (conditions under which the LTOP System is placed into service) and pressure uncertainty (actuation setpoint)".

6. *In Section 3.2.1, it is indicated that the computer code BWNT RELAP5/MOD2-B&W is used by RG&E for LTOP design. Please provide discussion on the applicability of this computer code for LTOP design at Ginna. Also, discuss the staff review status for this computer code.*

The report referenced in the RG&E specified methodology (Reference 19) for computer code BWNT RELAP5/MOD2 has been reviewed and approved by the NRC. This referenced report documents the B&W Nuclear Technologies (BWNT) adaptation of the Idaho National Engineering Laboratory (INEL) RELAP5/MOD2 Cycle 36.05 code. The fundamental equations, constitutive models and correlations, and method of solution of Cycle 36.05 code are preserved in the BWNT version with input options added to invoke several revised models. These revised models were developed to: (1) address specific deficiencies in the base code, and (2) extend the capability of the code as required to model systems unique to certain designed PWRs (e.g., high elevation AFW injection lines). Application of this code to Westinghouse PWRs is documented in BAW-10169P-A.

RG&E considers this code to be acceptable for the LTOP transients. For the LTOP analyzed transients, the RCS fluid remains a single-phase liquid. Therefore, the important code process and closure models are: (1) state property search, (2) single-phase flow, (3) single-phase wall heat transfer, (4) RCS pump flow, and (5) choked flow through the PORV. These are discussed in more detail below with respect to the models used for Ginna Station.

The RELAP5 property routines are designed to calculate any fluid state between atmospheric pressure and critical pressure. Difficulty in resolving state properties is typically encountered where two-phase search inputs are calculated during a timestep that is out of range. However, the single-phase conditions that are expected in the LTOP transients preclude this problem.

The governing field equations in RELAP5 are formulated from conventually accepted forms of the conservative equations for nonequilibrium, nonhomogeneous two-phase flows. In the LTOP calculations, these coded difference equations will "collapse" to that for unsteady, one-dimensional single-phase flows. Except for the necessary correlated closure models, these forms are independent of pressure and temperature conditions and acceptable for use.

In RELAP5 the wall friction will be computed from a numerical fit to the Colebrook Correlation. The wall friction factor is calculated using $\lambda_L = 64/Re$. The plant input model includes the necessary adjustments to ensure that the pressure drops and flows for other geometries are consistent with the target conditions. Single-phase wall heat transfer under turbulent flow conditions will be calculated using the Dittus-Beolter Correlation. This correlation is well accepted and has been extensively used for single-phase heat transfer without the restrictions regarding fluid pressure. For lower flow rates, RELAP5 will use the industry-standard laminar and free convection correlations.

The RELAP5 pump process model is not used for the LTOP models. Instead, field test data of RCS flow versus time will be input as a boundary condition.

The PORV choked flow calculation will be performed using the Henry-Fauske model which is widely accepted and which has been successfully benchmarked with the subcooled liquid over a range of pressures.

In summary, for the LTOP calculations, RELAP5/MOD2 Version 20.0HP has the necessary process and closure models to analyze the key phenomena. The RCS remains subcooled, which allows the code to use the established single-phase models, where the accuracy is not a function of pressure. Furthermore, the pressures associated with this transient are high enough that the code could adequately calculate two-phase conditions if they existed.

RG&E will provide a corrected version of the LTOP system setpoint methodology following NRC acceptance of these responses and our response to any other potential future questions. Please contact Brian Flynn at (716) 771-4805 if you have any questions related to this RG&E specific methodology.

Very truly yours,

Robert C. Mecredy

MDF\743

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